COMMONWEALTH OF MASSACHUSETTS DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY D.T.E. 03-121

PREFILED DIRECT TESTIMONY OF
SEAN CASTEN
MARCH 16, 2004

	D.1.E. 03-121
1	Please state your name, occupation and business address.
2	My name is Sean Casten. I am the President and Owner of Turbosteam Corporation,
3	an 18-year old Massachusetts-based manufacturer of cogeneration systems. Our
4	office and manufacturing facility is located at 161 Industrial Blvd., Turners Falls MA
5	01376.
6	
7	On whose behalf are you testifying in this proceeding?
8	I am testifying on behalf of Turbosteam Corporation, as a member of the NE DG
9	Coalition.
10	
11	Please describe your qualifications and experience.
12	My company has installed 165 small generators at our customer's facilities since
13	1986. These units have been installed in 38 states and 18 countries worldwide, and
14	range from 50 kW to 6 MW nominal output. Prior to acquiring the company from
15	Trigen Energy Corporation in 2000, I spent three years at the consulting firm Arthur
16	D. Little where I specialized in distributed generation technologies and strategies, and
17	my clients included equipment manufacturers, electric and gas utilities, government
18	agencies and the Electric Power Research Institute. I am also the Policy Chair of the
19	Northeast Combined Heat and Power Initiative, and on the Executive Committee of

the U.S. Combined Heat and Power Association. As a part of my responsibilities for

the Northeast CHP Initiative, I was one of the 40-plus active participants in the recent

20

21

- 1 Massachusetts interconnection proceedings. I have a B.A. from Middlebury College,
- 2 a M.S. in engineering from Dartmouth College and a Masters of Engineering
- 3 Management from Dartmouth College.

4

- 5 Please describe the purpose and conclusions of your testimony.
- 6 The purpose of my testimony is to describe how the rates proposed by NSTAR will
- 7 cause customers who install DG to bear an inappropriate share of the distribution
- 8 system costs and discourage development of cost-effective DG. Moreover, the
- 9 proposed rates will hinder the deployment of clean distributed generation
- technologies in NSTAR's territory that can reduce the overall energy costs of
- 11 Massachusetts consumers by producing energy more efficiently and for less cost than
- they would otherwise pay. I have concluded that the standby rates would send
- inappropriate economic price signals to my potential customers considering DG.
- 14 Furthermore, the rates place the greatest economic obstacles on some of the cleanest
- and most grid-beneficial technologies. Finally, this rate fully accounts for potential
- 16 costs but fails to include the potential benefits that distributed generation can bring to
- make energy more affordable for customers in Massachusetts. After analyzing the
- standby rate tariff proposed for Boston Edison in some detail, I concluded that the
- rate is inherently anti-competitive and serves primarily to prevent anyone other than
- 20 NSTAR from providing electricity to current NSTAR customers. This tariff thus
- 21 stands in direct opposition to the Department's mission to "...ensure that utility

1	consumers are provided with the most reliable service at the lowest possible cost",
2	since it would effectively prevent the deployment of technologies that reduce the cost
3	of energy to Massachusetts consumers and enhance overall system reliability. This
4	tariff also runs counter to stated policies of the Commonwealth to advance the
5	deployment of distributed generation technologies.
6	
7	Do you have any systems installed in NSTAR's service territory?
8	Turbosteam installed a system at Suffolk County Jail in 1998 that has a nominal
9	power output of 100 kW. Prior to installation, the Jail purchased high-pressure steam
10	from Trigen-Boston and reduced the pressure through a valve before distributing
11	lower pressure steam to the jail for heating and hot water. Our system captures the
12	energy inherent in this pressure reduction to spin a steam turbine, which is coupled to
13	an electrical generator. Since coming on line in 1999, all of the steam entering the
14	jail has been directed through our turbine-generator before going on to serve local
15	heating loads. The net impact of the system has been to reduce the jail's operating
16	expenses by approximately \$15,000 per year while leading to no discernible increase
17	in steam purchase from Trigen, thus providing a source of electricity with no
18	marginal emissions or fuel purchase.
19	
20	
21	

1	Can you describe the operating characteristics of the systems you have installed?
2	Our business model is based on identifying opportunities like that at Suffolk County
3	Jail where we can recycle electricity from existing thermal sources. We refer to this
4	as "heat-first combined heat and power", as our design approach is based on recycling
5	waste energy from an existing thermal source, and necessarily means that our
6	generators operate only when there is a need for low-grade heat. In most cases, this
7	means that our systems produce maximum power during the winter months, although
8	this is not universally true. In all cases, this means that the marginal cost and fuel use
9	of our generators per kilowatt-hour of power production is essentially zero. The
10	volume of available heat that can be economically recycled as electricity is usually
11	much less than the full power needs of the facility. As a result, we design to parallel
12	with incoming utility service either with an induction or synchronous generator as
13	appropriate. In a few cases, we have designed units to be directly coupled to
14	mechanical loads and take an existing motor off line rather than generate electricity
15	for distribution into the local bus. Ironically, the coupling of a steam turbine to a
16	mechanical drive that displaces an electric motor load is often supported through
17	DSM funds, while the same device coupled to a generator would have an identical
18	economic impact on the utility but would be discouraged by the proposed standby
19	rate.

1	What are the critical factors that determine whether or not a potential project is
2	constructed and brought on-line?
3	Economics and risk. We offer projects either as a pure capital sale to our customers,
4	or through a financing mechanism wherein we finance the project and recover our
5	costs and profits through a long-term contract for a fraction of the savings we create.
6	If sold as a capital sale, we find that projects need to have exceptionally high returns
7	on capital – typically over 40% ROA – to proceed. Since our customers are not
8	normally in the business of producing electricity, they perceive such investments as
9	much riskier than those of their core business and demand accordingly higher returns.
10	If we finance the projects ourselves, we assume project risk but still require
11	comparable overall returns so that we can recover our capital costs, earn a reasonable
12	profit and still have enough residual savings to share with our customer. As a
13	practical matter, our experience is that viable projects of either type thus require total
14	energy savings sufficient to recover all capital in 2 years or less and must have a
15	sufficient low risk profile for our company, our lenders and our customers to justify
16	the initial development period.
17	
18	Are you familiar with the standby rates proposed by NSTAR Electric?
19	Yes.
20	
21	

1	what is your assessment of the impact such rates will have on your business.
2	In all likelihood, if these rates are imposed, we would not continue to do business in
3	NSTAR's territory. If similar rates are adopted throughout the state, we likely will
4	not be able to pursue business in Massachusetts. We estimate that the standby rate
5	proposed by NSTAR would reduce the actual savings realized by a "typical"
6	customer by $15 - 50\%$ per year, depending on rate classification and operating
7	profile. For most projects, such a reduction in savings will effectively kill the project
8	taking it beyond the realm that we can finance and reducing the returns to levels that
9	are not acceptable to our customers.
0	
1	Do you support adoption of the proposed rates?
2	No.
3	
4	Why not?
5	For four reasons:
6	1. First, NSTAR's proposed rates fail to take into account the benefits created
7	by DG. By providing base-load or near-base-load generation at the end of the
8	wire, our generators reduce the need for grid upgrades and reduce grid
9	congestion in exactly the same way that DSM investments do, and can - if
20	designed properly – produce reactive power at the end of the wire to enhance
21	the power factor of the entire grid. Furthermore, our generators are 3 times as

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

efficient as the central power grid, meaning that every project we deploy reduces the emissions associated with power generation. Finally, our customers have all elected to consider DG out of a desire to minimize their operating costs and become more competitive. This fundamentally means that any exclusionary rates that slow the penetration of DG dull the competitiveness of Massachusetts businesses. Since the proposed standby rate is ostensibly based on costs and has not factored in any of these benefits, it is almost certain to overstate the adverse effect of DG on NSTAR and hence to overcompensate NSTAR for services thus provided. 2. Second, the proposed rates would impose an unfair and unreasonable burden on customers and will likely deny them the benefits of clean, efficient cogeneration. By our analysis, NSTAR will in some cases charge a customer more for "standing by" for distribution service than it would a similarly situated all requirements customer to which it was providing power. As a businessman, I don't understand how you can legally charge a customer more for a product or service they don't buy from you than for the products or services that they do buy from you. 3. Third, we object to the proposed rates because the scope of this rate proceeding constrains the debate and compresses the time available to consider the myriad issues regarding distributed generation and the appropriate design of standby rates. In the restructured energy market,

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

NSTAR is but one link in a complex chain of market participants. However, they are a vital link because they have a virtual monopoly on access to the customers and the broader electric market. As it is, the power supply in the state is impacted by generation, transmission, regional ISOs and a thousand tiny decisions made by electricity users on a daily basis, none of which are under the jurisdiction of the DTE. NSTAR is no longer the only provider of energy in its service territory, and in many cases, it is not the low cost provider. A host of issues from appliance efficiencies to distributed generation to standard market design lie outside of NSTAR's – and hence the DTE's – purview and yet they have the potential to drastically alter the reliability and cost of electricity in the Commonwealth. This rate case represents an effort by NSTAR to prematurely ram through an exclusionary rate that will effectively prevent customers from fully participating in the restructured energy market and may well block the deployment of many emerging technologies that are cleaner, cheaper and in many cases more reliable than the existing system. 4. Fourth, NSTAR's rates contradict stated policy goals of the Department and the Commonwealth. A part of the Department's mandate is to "...ensure that utility consumers are provided with the most reliable service at the lowest possible cost." DG reduces grid congestion and hence system losses, allows

deferral of expensive transmission and distribution upgrades and reduces

1	energy costs to the DG owner. In other words, it enhances system reliability
2	and reduces system costs – and the need to facilitate further deployment of
3	DG was recognized by the Department's own Task Force on Outage
4	Preparedness earlier this year. Moreover, the legislature has created a
5	Renewable Energy Trust, collected by a surcharge on electric ratepayers, that
6	seeks to encourage the development of distributed generation. By deterring
7	and/or eliminating the deployment of DG technologies, the proposed rate is
8	antithetical to the Department's mission and the stated policies of the
9	Commonwealth.
10	
11	In your experience as a developer of DG projects, how would the Standby rates
12	proposed by NSTAR affect your approach to system design?
13	We found that the NSTAR rate has the least negative impact on DG systems that are
14	base-loaded and to systems that peak during the winter months. By contrast, the
15	maximum negative impact from the proposed standby rate would accrue to summer-
16	peaking systems and to systems that show strong daily load fluctuation. In the case of
17	our company's products where the bulk of our installations are winter-peaking
18	anyway, this latter design objective does not imply a substantial change, but the
19	preference for base-loading would lead us to size smaller units, and hence recycle less
20	energy waste. At a system level, the preference for base-loaded and winter-peaking
21	would effectively give DG operators a set of incentives that seem exactly opposite to

1	the distribution utility, since their units would be designed <u>not</u> to provide load
2	reduction precisely during those times when load reductions are most needed. I
3	suspect that manufacturers of solar panels would be particularly troubled by this rate
4	given the sizable cost-penalty it imposes on systems with very "peaky" operating
5	profiles, and imagine that people more familiar with other DG technologies would
6	have other concerns I have not yet identified. However, at the most general level, it
7	seems to me that a well-designed rate ought to provide DG owner with the same
8	incentives as the utility. The implicit penalty that this rate imposes on systems that
9	ease grid congestion during summer peaks would thus seem to send exactly the
10	wrong market signals.
11	
12	Does this conclude your testimony?
13	Yes.